Revised ~~5/1/03~~11/3/03

HUMPBACK WHALE (*Megaptera novaeangliae*):
Central North Pacific Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The humpback whale is distributed worldwide in all ocean basins, though it is less common in Arctic waters. In winter, most humpback whales occur in the temperate and tropical waters of the North and South Hemispheres (from 10°-23° latitude). Humpback whales in the high latitudes of the North Pacific are seasonal migrants that feed on zooplankton and small schooling fishes ~~in the cool, coastal waters of the western United States, western Canada, and the Russian Far East~~ (NMFS 1991). The historic feeding range of humpback whales in the North Pacific encompassed coastal and inland waters around the Pacific rim from Point Conception, California, north to the Gulf of Alaska and the Bering Sea, and west along the Aleutian Islands to the Kamchatka Peninsula and into the Sea of Okhotsk (Nemoto 1957, Tomlin 1967, Johnson and Wolman 1984). A recent vessel survey in the central Bering Sea in July of 1999 documented 17 humpback whale sightings, most of which were distributed along the eastern Aleutian Island chain and along the U.S.-Russia Convention Line south of St. Lawrence Island (Moore et al. 2000). ~~These recent sightings clearly demonstrate that the Bering Sea remains an important feeding area.~~ Humpback whales have been known to enter the Chukchi Sea (Johnson and Wolman 1984). The humpback whale population in much of this range was considerably reduced as a result of intensive commercial exploitation during the 20th century.

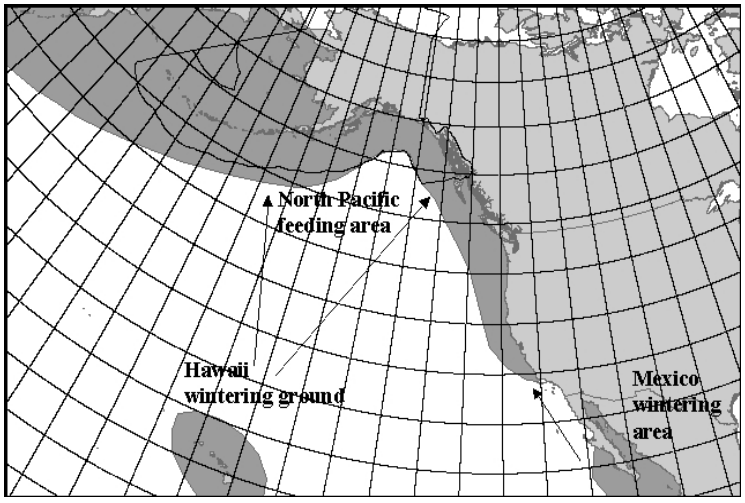

Figure 34. Approximate distribution of humpback whales in the eastern North Pacific (shaded area). Feeding and wintering areas are presented above (see text). See Figure 33 for distribution of humpback whales in the western North Pacific.

Aerial, vessel, and photo-identification surveys and genetic analyses indicate that within the U. S. Exclusive Economic Zone (EEZ) there are at least three relatively separate populations that migrate between their respective summer/fall feeding areas to winter/spring calving and mating areas (Calambokidis et al. 1997, Baker et al. 1998, Figs. 33 and 32): 1) winter/spring populations in coastal Central America and Mexico which migrate to the coast of California~~4~~ to southern British Columbia in summer/fall (Calambokidis et al. 1989, Steiger et al. 1991, Calambokidis et al. 1993) - referred to as the California/Oregon/Washington and Mexico stock; 2) winter/spring populations of the Hawaiian Islands which migrate to northern British Columbia/Southeast Alaska and Prince William Sound west to Unimak Pass~~Kodiak~~ (Baker et al. 1990, Perry et al. 1990, Calambokidis et al. 1997) - referred to as the Central North Pacific stock; and 3) winter/spring populations of Japan which, based on Discovery ~~Tag~~Mark information, probably migrate to waters west of the Kodiak Archipelago (the Bering Sea and Aleutian Islands) in summer/fall (Berzin and Rovnin 1966, Nishiwaki 1966, Darling 1991) - referred to as the Western North Pacific stock. Winter/spring populations of humpback whales also occur in Mexico's offshore islands. The migratory destination of these whales is not well known (Calambokidis et al. 1993, Calambokidis et al. 1997), although whales from the the Revillagigdeo Archipelago have been matched to animals seen off of mainland Mexico, Hawaii, and Alaskan waters (S. Mizroch, North Pacific Humpback Whale Working Group, unpublished data). Some recent exchange between winter/spring areas has been documented (Darling and McSweeney 1985, Baker et al. 1986, Darling and Cerchio 1993), as well as movement between Japan and British Columbia, and Japan and the Kodiak Archipelago (Darling et al. 1996, Calambokidis et al. 1997).

Currently, there are insufficient data to apply the Dizon et al. (1992) phylogeographic approach to classify population structure in humpback whales. Until further information becomes available, 3 stocks of humpback whales (as described above) are recognized within the U. S. EEZ of the North Pacific: one in the Eastern North Pacific (the California/Oregon/Washington - Mexico stock), one in the Central North Pacific, and one in the Western North Pacific.

The California/Oregon/Washington - Mexico humpback whale stock is reported separately in the Stock Assessment Reports for the Pacific Region.

The central North Pacific stock of humpback whales consists of feeding aggregations along the northern Pacific rim, and some humpbacks are present offshore in the Gulf of Alaska (Brueggeman et al., 1989). Humpback whales are also present in the Bering Sea (Moore et al. 2002); it is not conclusively known whether these animals belong to the western or central North Pacific stocks. Three feeding areas for the Central North Pacific stock that have been studied using photo-identification techniques are southeastern Alaska, Prince William Sound, and Kodiak Island. There has been some exchange of individual whales between these locations. For example, six whales have been sighted in Prince William Sound and southeastern Alaska since studies began in 1977 (Perry et al. 1990, von Ziegesar et al. 1994; S. Baker, D. McSweeny, J. Straley, O. von Ziegesar, unpubl. data, Mizroch et al., in review); nine whales have been sighted between Kodiak Island, including the area adjacent to Kodiak along the Kenai Peninsula, and Prince William Sound; and two whales have been sighted between Kodiak and southeastern Alaska (Waite et al. 1999). Calambokidis et al. (2001) reports interchange between Kodiak, Prince William Sound, and Southeast Alaska, although the number of individuals seen in multiple locations is small. No interchange was reported between the Shumagin Islands and any other feeding area; however, given that the number of animals photographed in the vicinity of the Shumagin Islands was very small (15), this result may not be surprising. Mizroch et al. (in review) examined photographs from 1979 to 1996 and reported that under 1% of the individual whales photographed in either Southeast Alaska or Prince William Sound moved between areas. Fidelity to feeding areasis maternally directed; that is, whales return to the feeding areas where their mothers first brought them as calves (Martin et al. 1984, Baker et al. 1987).

As noted above, there is very little interchange documented between the Southeast Alaska feeding area and the Prince William Sound, Kodiak, and Shumagin Islands feeding areas to the north. Because of the documented lack of interchange, it is possible that a severe reduction in the population in the Southeast Alaska feeding area would not be augmented by animals frequenting other feeding areas within a timeframe relevant to managers. Thus, NMFS is considering whether the Southeast Alaska feeding area, and possibly other feeding areas in the North Pacific, should be formally designated as separate stocks under the MMPA. In preparation for this decision, a PBR level and annual mortality rates will be calculated for the Southeast Alaska feeding area and included in the report for the entire central North Pacific humpback whale stock in order to guide managers in prioritizing conservation actions.

POPULATION SIZE

This stock of humpback whales winters in Hawaiian waters (Baker et al. 1986). Baker and Herman (1987) used capture-recapture methodology in Hawaii to estimate the population at 1,407 (95% CI 1,113-1,701), which they considered an estimate for the entire stock (NMFS 1991). However, the robustness of this estimate is questionable due to the opportunistic nature of the survey methodology in conjunction with a small sample size. Further, the data used to produce this estimate were collected between 1980 and 1983.

The current abundance estimate of humpback whales in the North Pacific is based on data collected by nine independent research groups that conducted photo-identification studies of humpback whales in the three wintering areas (Mexico, Hawaii, and Japan). Photographs taken between 1991 and 1993 were used to estimate abundance because samples throughout the entire North Pacific were the largest and most complete during this period. Using Darroch's (1961) method, which utilizes only data from wintering areas, and averaging the 1991-92, 1992-93, and 1991-93 winter release-recovery information results in an abundance estimate of 4,005 (CV = 0.095) for the entire central North Pacific humpback whale stock (Calambokidis et al. 1997).

Photo-identification methods were used to identify 149 individual humpback whales identified in Prince William Sound from 1977 to 1993 (von Ziegesar 1992, Waite et al. 1999). The abundance of the Prince William Sound feeding aggregation is thought to be less than 200 whales (Waite et al. 1999). Waite et al. (1999) identified 127 individuals in the Kodiak area between 1991 and 1994, and calculated a total annual abundance estimate of 651 (95% CI: 356-1,523) for the Kodiak region.

Photo-identification studies initiated to the west of Kodiak Island in 1999 have identified approximately 350 individual humpback whales, and matches between these animals and animals documented in Hawaii, Japan and Mexico have occurred (B. Witteveen, unpublished report). It is not known how many animals occurring to the west of Kodiak Island belong to the western or central North Pacific stock.

In the Northern British Columbia region (primarily near Langara Island), 275 humpback whales were identified from 1992 to 1998 (G. Ellis, pers. comm., Pacific Biological Station, Nanaimo, BC, V9R 5K6).

Different studies have used different approaches to estimate the abundance of animals in Southeast Alaska.

Baker et al. 1992 estimated an abundance of 547 (95% CI: 504-590) using data collected from 1979 to 1986. Straley (1994) recalculated the estimate using a different analytical approach (Jolly-Seber open model for capture-recapture data) and obtained an mean population estimate of 393 animals (95% CI: 331-455) using the same 1979 to 1986 data set. Using data from 1986 to 1992 and the Jolly-Seber approach, Straley et al. (1995) estimated that the annual abundance of humpback whales in southeastern Alaska was 404 animals (95% CI:350-458). Straley et al. (2002) examined data for the northern portion of Southeast Alaska from 1994-00 and provided and updated abundance estimate of 961 (95% CI: 657-1,076). The sum of the available estimates for the known feeding areas is 2,036 (149 in PWS, 651 in Kodiak, 961 in Southeast, and 275 in British Columbia), which is well below the Calambokidis et al. (1997) estimate of 4,005 based on data collected from 1991to 1993. However, the estimate for Southeast Alaska is known to be a minimum estimate because there is little to no photo-identification effort in the lower half of Southeast Alaska (south of Frederick Sound). In addition, many humpback whales feed seasonally near the Shumagin Islands, where photo-identification studies have only recently been initiated, and humpbacks are seen pelagically in the Gulf of Alaska. Finally, Moore et al. (~~in press~~2002) has documented humpback whales in the Bering Sea, and it is not conclusively known whether these animals belong to the central or western North Pacific humpback whale stock.

Minimum Population Estimate

The minimum population estimate (N_{MIN}) for this stock is calculated according to Equation 1 from the PBR Guidelines (Wade and Angliss 1997): $N_{MIN} = N/\exp(0.842\times[\ln(1+[CV(N)]^2)]^{½})$. Using the population estimate (N) of 4,005 and its associated CV(N) of 0.095, N_{MIN} for the entire central North Pacific humpback whale stock is 3,698.

Although the Southeast Alaska feeding aggregation cannot be considered a stock, the calculation of a PBR for this area may be useful for management purposes. Using the population estimate (N) of 961 and its associated CV(N) of 0.12, N_{MIN} for this aggregation is 868.

Current Population Trend

Comparison of the estimate for the entire stock provided by Calambokidis et al. (1997) with the 1981 estimate of 1,407 (95% CI 1,113-1,701) from Baker and Herman (1987) suggests that the stock has increased in abundance between the early 1980s and early 1990s. However, the robustness of the Baker and Herman (1987) estimate is questionable due to the small sample size and opportunistic nature of the survey. ~~As a result, although data support an increasing population size for this stock, it is not possible to assess the rate of increase.~~ **Mizroch et al. (in press) calculate an annual population rate of increase of 10%. This is within the range of 0.088 to 0.144 reported by Best (1993) for humpback whales off South Africa, and is identical to the 10% value reported by Bannister and Hedley (2001) for humpback whales off western Australia.**

The estimated number of animals in the Southeast Alaska portion of this stock has increased. The 2000 estimate of 961 (Straley et al. 2002) is substantially higher than estimates from the early and mid-1980s. A trend for the Southeast Alaska portion of this stock cannot be estimated from the data, however, because of differences in methods and areas covered.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Utilizing a birth-interval model, Barlow and Clapham (1997) have estimated a population growth rate of 6.5% (SE = 1.2%) for the well-studied humpback whale population in the Gulf of Maine. Although there are no estimates of the growth rate of the entire humpback whale population in the North Pacific , it is clear that the abundance has increased in Southeast Alaska in recent years. The available information indicates that the rate of increase between 1979 and 2000 is estimated at 0.088, which is a more accurate estimate of the maximum net productivity rate than the default estimate. Thus, it seems reasonable to use a 0.088 as a new, conservative estimate of the current rate of increase as the maximum net productivity rate.

POTENTIAL BIOLOGICAL REMOVAL

Under the 1994 reauthorized Marine Mammal Protection Act (MMPA), the potential biological removal (PBR) is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: $PBR = N_{MIN} \times 0.5R_{MAX} \times F_R$. The recovery factor ($F_R$) for this stock is 0.1, the recommended value for cetacean stocks listed as endangered under the Endangered Species Act (Wade and Angliss 1997). An estimate of the maximum net productivity rate is not available for the entire stock, so the default value of 0.04 will be used for both the entire stock and the portion of the stock which occurs in Southeast Alaksa. Thus, for the entire Central North

Pacific stock of humpback whale, PBR = 7.4 animals (3,698 × 0.02 × 0.1). The PBR level for the Southeast Alaska portion of this stock, PBR = 3.5 animals (868 × 0.04 × 0.1), and the PBR level for the northern portion of the stock is 3.9 animals (7.4 - 3.5).

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

Four different commercial fisheries operating in Alaska waters within the range of the Central North Pacific humpback whale stock were monitored for incidental take by fishery observers during 1990-01: Bering Sea/Aleutian Island groundfish trawl, Gulf of Alaska groundfish trawl, longline, and pot fisheries. One humpback whale mortality was observed in the Bering Sea/Aleutian Islands groundfish trawl fishery in 1998 and one in 1999. Average annual mortality from the observed fisheries in Alaska was 0.6 humpbacks from this stock (Table 27a). Note, however, that the stock identification is uncertain and the mortality may have been attributable to the western stock of humpback whales. Thus, this mortality is assigned to both the central and western stocks. Fishery observers also monitored the Hawaii swordfish, tuna, billfish, mahi mahi, wahoo, oceanic shark longline/setline fishery during the same period. The range of observer coverage for this fishery, as well as the annual observed and estimated mortalities, are presented in Table 27a. The observer program in the Hawaii fishery was voluntary from 1990 through 1993, leading to very low levels of observer coverage during those years (<1%). In 1994, the observer program became mandatory and observer coverage has been approximately 4-5% since that time. Fishery observers recorded one humpback whale entangled in longline gear in 1991. The fate of this animal is unknown, though it is presumed to have died. The mortality rate was not estimated from the 1991 mortality due to the low level of observer coverage in that year (<1%). Therefore, that single mortality also appears as the estimated mortality for 1991 and should be considered a minimum estimate. Note that another humpback whale was reported by fishers and whalewatch operators entangled in longline gear off Maui during 1993 (E. Nitta, pers. comm., National Marine Fisheries Service). This report was never confirmed and the fate of this animal is also unknown. The estimated mean annual mortality rate in all observed fisheries during the 5-year period from 1997 to 2001 is 0.4 humpback whales per year from this entire stock.

An additional source of information on the number of humpback whales killed or injured incidental to commercial fishery operations is the self-reported fisheries information required of vessel operators by the MMPA. During the 4-year period between 1990 and 1993, there were no fisher self-reports of humpback whale injuries or mortalities from interactions with commercial fishing gear in any Alaska fishery within the range of the Central North Pacific humpback whale stock. Logbook data are available for part of 1989-94, after which incidental mortality reporting requirements were modified. Under the new system, logbooks are no longer required; instead, fishers provide self-reports. Data for the 1994-95 phase-in period is fragmentary. After 1995, the level of reporting dropped dramatically, such that the records are considered incomplete and estimates of mortality based on them represent minimums (see Appendix 7 for details). In 1994, the incidental take of a humpback whale was reported in the Southeast Alaska salmon purse seine fishery. Another humpback whale is known to have been taken incidentally in this fishery in 1989, but due to its historic nature has not been included in Table 27a. In 1996, a humpback whale was reported entangled and trailing gear as a result of interacting with the Southeast Alaska drift gillnet fishery. This whale is presumed to have died. Together, these two mortalities result in an annual mortality rate of 0.4 (0.2 + 0.2) humpback whales based on self-reported fisheries information (Table 27a). This is considered to be a minimum estimate because logbook records (fisher self-reports required during 1990-94) are most likely negatively biased (Credle et al. 1994).

Table 27a. Summary of incidental mortality of humpback whales (Central North Pacific stock) due to commercial fisheries from 1990 through ~~2001~~**2002** and calculation of the mean annual mortality rate. Mean annual mortality in brackets represents a minimum estimate. For a particular fishery, the most recent 5 years of available data are used in the mortality calculation when more than 5 years of data are provided. n/a indicates that data are not available.

Fishery name	Years	Data type	Range of observer coverage	Observed mortality (in given yrs.)	Estimated mortality (in given yrs.)	Mean annual mortality
Hawaii swordfish, tuna, billfish, mahi mahi, oceanic shark longline/setline	~~90-00~~ 98 99 00 01 02	obs data	~~<1-5%~~ 4.6 3.5 11.8 22.7 24.9	~~0, 0, 0, 0, 0~~ 0 0 0 1 0	~~0, 0, 0, 0, 0~~ 0 0 0 4 0	0.8
Bering Sea/Aleutian Is. (BSAI) groundfish trawl	~~97-01~~ 98-02	obs data	62-77%	~~0~~ 0 1 0 0 0	~~0~~ 2 2 0 0 0	0.6 ~~(CV = 0.44)~~ (CV = xxx)
Observer program total						~~0.6~~1.4
				Reported mortalities		
Southeast Alaska salmon drift gillnet	90-0~~1~~2	self reports	n/a	0, 0, 0, 0, n/a, n/a, 1, n/a, n/a, n/a, n/a, n/a, **n/a**	n/a	[≥0.2]
Southeast Alaska salmon purse seine	90-0~~1~~2	self reports	n/a	0, 0, 0, 0, 1, n/a, n/a, n/a, n/a, n/a, n/a, n/a, **n/a**	n/a	[≥0.2]
Minimum total annual mortality from observer programs and self reports						North: [≥~~0.6~~1.4] SE: [≥~~0.4~~1.2]

Reports of entangled humpback whales found swimming, floating, or stranded with fishing gear attached occur in both Alaskan and Hawaiian waters. All reports of mortalities or injuries of humpback whales from the central North Pacific stock from ~~1997~~1998 to ~~2001~~2002 are provided in Table 27b and a summary of the information is provided in Table 27c. Overall, there were ~~34~~36 reports of human-related mortalities or injuries during this 5-year period. Of these, there were ~~27~~29 incidents which involved commercial fishing gear, and ~~24~~15 of these incidents involved serious injuries or mortalities. An additional seven incidents of human-related mortality or injury involved ship strikes and will be discussed in a forthcoming section. This estimate is considered a minimum because not all entangled animals strand and not all stranded animals are found, reported, or cause of death determined.

Table 27b. Human-related strandings and entanglements of humpback whales (central North Pacific stock) from stranding reports, ~~1997-2001~~1998-2002. Areas are designated "SE" for Southeast Alaska or "North" for all other feeding areas; "Unk" indicates that the feeding area to which a whale belongs is unknown; it is assumed that the entanglement was reported in the area where the entanglement occurred, and that duplicate sightings have been removed. An asterisk in the "number" column indicates cases that were not considered serious injuries and thus were not included in the summarized information included in Table 27c.

Year	Number	Area	Condition	Brief description	Area
~~1997~~	~~1*~~	~~Island of Hawaii~~	~~Released alive~~	~~Alaska crab pot floats removed by U.S. Coast Guard~~	~~Unk~~
~~1997~~	~~1~~	~~57 30 N 135 13 W NW Shelter Island~~	~~Alive~~	~~Collision with skiff~~	~~SE~~

Year	Number	Area	Condition	Brief description	Area
~~1997~~	~~1~~	~~Peril Straits, AK~~	~~Injured~~	~~Entangled in line; attempt to disentangle failed~~	~~SE~~
~~1997~~	~~1~~	~~58 18 N 134 24 W NW Shelter Island~~	~~Injured~~	~~Tail wrapped in crab pot line~~	~~SE~~
~~1997~~	~~1~~	~~58 21N 134 57 W NW Admiralty Island~~	~~Alive; entangled~~	~~Line and 2' diameter buoy attached~~	~~SE~~
1998	1	Maalaea Bay, Lanai	Alive; entangled	Disentangled from gear, but some line still attached	Unk
7/28/98	1*	Petersburg	Alive, entangled, collision	Trailing possible king crab buoy & line; surfaced under boat; disentangled except for a loop of line around fluke	SE
~~1998~~ 7/18/98	1*	Sitka, AK	Alive; entangled	~~Commercial gillnet around flippers~~ Thick green net around head & flippers, not impeding progress	SE
1998	1*	Jakolof Bay	Alive	Disentangled from personal use pot gear (not included in AKR records)	North
~~1998~~ 7/31/98	1	Ketchikan, AK	Injury; status unknown	Salmon purse seiner net (commercial) torn through, thought to have died	SE
~~1998~~ 8/11/98	1*	Juneau, AK	~~Injured~~Alive, apparently uninjured	Ship strike ~~(8/11)~~; whale surfaced under an idle-ing catamaran; "glancing blow"; whale observed to blow and fluke with no apparent injury	SE
~~1998~~	~~1~~	~~Juneau, AK~~	~~Entangled~~	~~No details available~~ (propose deleting - uncomfirmed report)	~~SE~~
~~1998~~ 8/23/98	1*	Wrangell, AK	Alive	Commercial crab pot buoy removed	SE
~~1998~~ 9/17/98	1*	Homer, AK	Alive	Subsistence/personal use tanner crab pot cut loose	North
~~1998~~ 9/24/98	1*	Juneau, AK	Injured	Ship strike ~~(9/24)~~; 24' vessel ran up dorsal surface of animal; animal observed for some time prior to incident and was behaving normally	SE
~~1998~~ 10/15/98	1*	Sitka, AK	Alive	Commercial crab pot line cut free	SE
~~1998~~	~~1~~	~~Ketchikan~~	~~Entangled~~	~~Swimming freely with pot gear attached~~ (propose deleting - uncomfirmed report)	~~SE~~
1/6/99	1	Hawaii, location not reported	Entangled	Line behind blowhole, connects to a single float	Unk
~~1999~~ 9/9/99	1	Homer	Entangled	In personal use crab pot gear; released (not in AKR records)	North
6/9/99	1*	Sitka	Entangled	Line, buoy wrapped around whale; animal had no problems diving, breathing or swimming; NMFS vessel had difficulty keeping up	SE

Year	Number	Area	Condition	Brief description	Area
7/7/99	1	Sitka	Alive	Ship strike; whale struck 73' wooden sailboat at anchor; made 5' hole in hull; baleen left in area	SE
7/28/99	1	Juneau	Alive	Ship strike; whale found on bow of ship	SE
9/6/99	1*	Sisters Island	Alive	Ship strike; whale surfaced under sailboat, brought tail down on forward deck; no apparent injury to whale	SE
~~1999~~ 10/99	1*	Prince of Wales Island	Entangled	In unknown pot gear, released completely by owner of pot gear, whale swam off	SE
~~1999~~ 11/99	1	Metlakatla	Injury; status unknown	Ship strike; vessel was a recreational bayliner, skin left on bow of vessel	SE
~~2000~~ 7/8/00	1~~*~~	Lynn Canal	Entangled~~;~~ ~~released alive~~, status unknown AKR report does not indicate release	~~Purse s~~Seine gear; completely entangling whale	SE
~~2000~~ 12/4/00	1~~*~~	Skagway	Entangled, released alive	Shrimp pot gear; released except for a single buoy	SE
~~2000~~ 10/16/00	1	Uyak Bay	Entangled, released	Unknown line, gear; not clear whether animal was completely released from gear	North
1/28/01	1	Hawaii	Injured	Entangled in line/buoy from an AK fishery; released, injured - extent unknown	Unk
6/19/01	1	Dixon Entrance	Possibly injured	Probable s~~S~~hip strike; whale surfaced immediately in front of large vessel, vessel backed down and stopped, crew heard a "thump" just prior to backing down	SE
5/28/01	1	Resurrection Bay	Entangled, released alive	Swimming freely with multiple lines and buoys attached (not in AKR records)	North
6/15/01	2	Kodiak	Entangled	Attempt to disentangle failed; mother/calf pair (not in AKR records)	North
7/12/01	1	Yakutat	Found dead	Entangled in salmon set gillnet; may be same incident as one reported on 7/30/01	North
7/16/01	1	Glacier Bay	Found dead, decomposed	Ship strike; fractured skull and pre-mortem hemorrhage	SE
~~July~~ 7/30/01	1	Bering Glacier	Found dead, decomposed	Entangled in gill net with floats~~fishing gear~~	North
8/13/01	1*	Hoonah	Entangled, released alive	Shrimp pot gear; wounds on dorsal ridge and tail stock	SE
9/18/01	1	Anchorage	Dead	Ship strike - container ship	North
9/19/01	1*	Lynn Canal	Entangled, release alive, status unknown	Shrimp pot gear	SE

Year	Number	Area	Condition	Brief description	Area
~~10/30/01~~	~~1*~~	~~Sitka~~	~~Entangled, release alive, status unknown~~	~~Longline gear (propose deleting - uncomfirmed report)~~	~~SE~~
1/23/02	1	HI - Napali Coast, Kauai	Entangled, dead	Entangled in net; tiger sharks seen feeding following death	HI
2/02	1	HI - Penguin Banks, Molokai	Entangled, alive	Entangled in float and line	HI
2/28/02	1*	HI - Kihei, Maui	Entangled, alive	No additional information	HI
3/02	1	Offshore Maui	Alive	Vessel collision - no additional information	HI
3/15/02	1*	Offshore Maui	Alive	Whale hit catamaran	HI
3/15/02	1*	Offshore Maui	Alive	SAME RECORD AS ABOVE Large boat hook in rostrum	HI
6/22/02	1*	Fern Harbor	Alive	Ship strike; whale surfaced under recreational vessel coasting in neutral; no appearance of injury	SE
7/13/02	1*	Taku Inlet	Entangled, partially released	2 crab pots removed; may still trail some line	SE
7/21/02	1	Petersburg	Alive, entangled	Crab pot gear in mouth; buoy on right side of mouth, pot on left. Buoy side of the line encircled head and tangled with pot side of line	SE
8/15/02	1	Kupreanof Is	Alive, entangled	Green mesh trawl around left pec fin	SE
9/7/02	1*	Ketchikan	Alive, entangled, released	In tangled in 2 shrimp pots and 600' of line; line wrapped around head, fins, and mouth; completely disentangled	SE

Table 27c: Summary of central North Pacific humpback whale mortalities and serious injuries caused by entanglement and ship strikes from stranding reports, 199~~7~~8-200~~1~~2. Information used to determine whether an injury was serious or non-serious is included in Table 27b; all animals not identified with an asterisk in Table 27b are considered serious injuries or mortalities.

Area	Human activity/Fishery	Mortalities	Serious injuries	Average annual serious injury/mortality rate, 199~~7~~8-200~~1~~2
Northern				
	Ship strikes	~~0~~ 0 0 0 1 0	~~0~~ 0 0 0 0 0	0.2

Area	Human activity/Fishery	Mortalities	Serious injuries	Average annual serious injury/mortality rate, 1997~~8~~-200~~1~~2
	Crab gear	~~0~~ 0 0 0 0 **0**	~~0~~ 0 1 0 0 **0**	0.2
	Unspecified fishing gear/line	~~0~~ 0 0 0 ~~1~~**0** **0**	~~0~~ 0 0 1 3 **0**	~~1.~~0.**8**
	Salmon set gillnet	~~0~~ 0 0 0 ~~1~~**2** **0**	~~0~~ 0 0 0 0 **0**	0.~~2~~**4**
			Total	1.4/year fishery only 1.6/year total
Southeast				
	Ship strikes	~~0~~ 0 0 0 1 **0**	~~1~~ ~~2~~**0** ~~1~~**4** 0 1 **0**	1.2
	Crab pot gear	~~0~~ 0 0 0 0 **0**	~~1~~ 0 ~~0~~**1*** 0 0 **2**	0.~~2~~**6**
	Unspecified fishing gear/line	~~0~~ 0 0 0 0 **0**	~~2.~~ ~~2~~**0** ~~1~~**0** 0 0 **0**	~~1.2~~**0**
	Unspecified gillnet	~~0~~ 0 0 0 0 **0**	~~0~~ ~~1~~**0** 0 0 0 **0**	0~~.2~~
	Salmon purse seine	~~0~~ 0 0 0 0 **0**	~~0~~ 1 0 ~~0~~**1** 0 **0**	0.~~2~~**4**

Area	Human activity/Fishery	Mortalities	Serious injuries	Average annual serious injury/mortality rate, 1997~~8~~-200~~1~~2
			Total	1.~~8~~0/year fishery only ~~3.0~~2.2/year total
Hawaii - summer feeding area unknown				
	Vessel collisions	0 0 0 0 0	0 0 0 0 1	0.2
	Net entanglement	0 0 0 0 1	0 0 0 0 0	0.2
	Unspecified fishing gear	~~0~~ 0 0 0 0 0	~~0~~ 1 0 0 1 1	~~0.4~~0.6/year
			Total	0.8/year fishery only 1.0/year total

*** Personal use pot gear**

The estimated minimum mortality and serious injury rate incidental to commercial fisheries for the northern portion of the stock is ~~2.0~~3.6 humpback whales per year, based on observer data from Alaska (0.6), and stranding records from Alaska (1.4), and observer and stranding data from Hawaii (1.6) (Tables 27b and 27c). The estimated minimum mortality and serious injury rate incidental to the commercial fisheries in Southeast Alaska is ~~2.2~~3.0 humpback whales per year, based on observer data from Alaska (0.4), and stranding records from Alaska (1.0), and observer and stranding data from Hawaii (1.6) (~~1.8~~ Tables 27b and 27c). As mentioned previously, these estimates should be considered a minimum. No observers have been assigned to several fisheries that are known to interact with this stock, making the estimated mortality rate unreliable. Further, due to limited Canadian observer program data, mortality incidental to Canadian commercial fisheries (i.e., those similar to U.S. fisheries known to interact with humpback whales) is uncertain. Though interactions are thought to be minimal, the lack of data regarding the level of humpback whale mortality related to commercial fisheries in northern British Columbia are not available, again reinforcing the point that the estimated mortality incidental to commercial fisheries is underestimated for this stock.

Subsistence/Native Harvest Information

Subsistence hunters in Alaska have not been reported to take from this stock of humpback whales.

Other Mortality

Ship strikes and interactions with vessels unrelated to fisheries have also occurred to humpback whales. These cases are included in Table 27b and summarized in Table 27c. Of those, ~~seven~~eight ship strikes constitute "other sources" of mortality; ~~six~~six of these ship strikes occurred in Southeast Alaska, ~~and~~ one occurred in the northern portion of this stock's range, and one occurred in Hawaii. It is not known whether the difference in ship strike rates between Southeast Alaska and the northern portion of this stock is due to differences in reporting, amount of vessel traffic, densities of animals, or other factors. Averaged over the 5 year period from ~~1997 to 2001~~1998-02, these account for an additional ~~1.4~~1.6 humpback whale mortalities per year.

HISTORIC WHALING

The number of humpback whales in the North Pacific may have numbered approximately 15,000 individuals prior to exploitation (Rice 1978). Intensive commercial whaling removed more than 28,000 animals from the North Pacific during the 20th century and may have reduced this population to as few as 1,000 before it was placed under international protection after the 1965 hunting season (Rice 1978). This mortality estimate likely underestimates the actual kill as a result of under-reporting of the Soviet catches (Yablokov 1994).

STATUS OF STOCK

As the estimated annual mortality and serious injury rate for the entire stock (~~5.0~~**5.0**; ~~3.6~~**3.4** of which was fishery-related) is considered a minimum, it is unclear whether the level of human-caused mortality and serious injury exceeds the PBR level (7.4) for the entire stock. ~~However, t~~**T**he estimated annual mortality and serious injury rate in Southeast Alaska (~~3.0~~**2.6**, of which ~~1.8~~**1.4** was fishery-related) is less than ~~greater than~~ the PBR level if calculated only for the Southeast Alaska portion of the population (3.8). The minimum estimated fishery mortality and serious injury for this stock is not less that 10% of the calculated PBR for either the entire stock or the portion of the stock in Southeast Alaska and, therefore, can not be considered to be insignificant and approaching a zero mortality and serious injury rate. The humpback whale is listed as "endangered" under the Endangered Species Act, and therefore designated as "depleted" under the MMPA. As a result, the Central North Pacific stock of humpback whale is classified as a strategic stock. At least some portions of the stock have increased in abundance between the early 1980s and 2000, and the fact that the current rate of increase in Southeast Alaska may have recently declined **(insert reference here)** may indicate that the Southeast Alaska portion of the stock is approaching its carrying capacity. However, the status of the entire stock relative to its Optimum Sustainable Population size is unknown.

Habitat Concerns

This stock is the focus of a large whalewatching industry in its wintering grounds (Hawaii) and a growing whalewatching industry in its summering grounds (Alaska). Regulations concerning minimum distance to keep from whales and how to operate vessels when in the vicinity of whales have been developed for Hawaii waters in an attempt to minimize the impact of whalewatching. In 2001, NMFS issued regulations to prohibit most approaches to humpback whales in Alaska within 100 yards (91.4m; ~~(~~66 FR 29502; May 31, 2001~~)~~). The growth of the whalewatching industry, however, is a concern as preferred habitats may be abandoned if disturbance levels are too high.

Noise from the Acoustic Thermometry of Ocean Climate (ATOC) program, the U.S. Navy's Low Frequency Active (LFA) sonar program, and other anthropogenic sources (i.e., shipping and whalewatching) in Hawaii waters is another concern for this stock. Results from experiments in 1996 off Hawaii indicated only subtle responses of humpback whales to ATOC-like transmissions (Frankel and Clark 1998). Frankel and Clark (2002) indicated that there were also slight shifts in humpback whale distribution in response to ATOC. Efforts are underway to evaluate the relative contribution of noise (e.g., experiments with LFA sound sources) to Hawaii's marine environment, although reports summarizing the results of recent research are not available.

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NORTH PACIFIC RIGHT WHALE (*Eubalaena japonica*):
Eastern North Pacific Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Whaling records indicate that right whales in the North Pacific ranged across the entire North Pacific north of 35°N and occasionally as far south as 20°N (Rosenbaum et al. 2000; Fig. 37). Before right whales in the North Pacific were heavily exploited by commercial whalers, concentrations were found in the Gulf of Alaska, eastern Aleutian Islands, southcentral Bering Sea, Sea of Okhotsk, and Sea of Japan (Braham and Rice 1984). During 1958-82, there were only 32-36 sightings of right whales in the central North Pacific and Bering Sea (Braham 1986). In the eastern North Pacific, south of 50°N, only 29 reliable sightings were recorded between 1900 and 1994 (Scarff 1986, Scarff 1991, Carretta et al. 1994), and one in 1996 off the tip of Baja, California (Gendron 1999). Sightings have been reported as far south as central Baja California in the eastern North Pacific, as far south as Hawaii in the central North Pacific, and as far north as the sub-Arctic waters of the Bering Sea and Sea of Okhotsk in the summer (Herman et al. 1980, Berzin and Doroshenko 1982, NMFS 1991, Brownell et al. 2001).

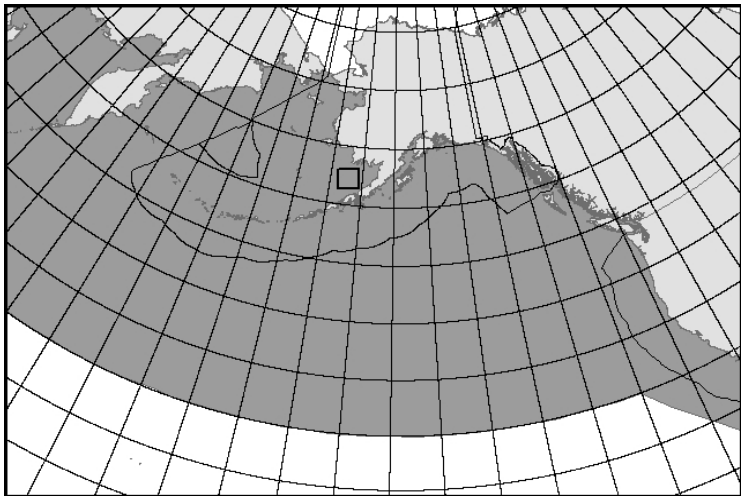

Figure 37. Approximate distribution of North Pacific right whales in the eastern North Pacific (shaded area). The box outlines the area in Bristol Bay where intensive aerial and vessel surveys for right whales have occurred from 1999 to 2002.

Atlantic and southern hemisphere ~~R~~right whales calve in coastal waters during the winter months. However, in the eastern North Pacific no such calving grounds were ever found (Scarff 1986). Migratory patterns of the North Pacific stock are unknown, although it is thought the whales spend the summer on high-latitude feeding grounds and migrate to more temperate waters during the winter (Braham and Rice 1984).

Information on the current seasonal distribution of right whales is available from dedicated vessel and aerial surveys, bottom-mounted acoustic recorders, and vessel surveys for fisheries ecology and management which have also included dedicated marine mammal observers. Aerial and vessel surveys for right whales have occurred in recent years in a portion of Bristol Bay where right whales have been observed each summer since 1996 (Fig. 37). North Pacific right whales are observed consistently in this area, and are not observed on dedicated vessel or aerial survey tracklines along the periphery of the area or outside the area (Tynan 1999; LeDuc et al. ~~2000~~2001; Moore et al. 2000; Moore et al. 2002; NMFS unpublished data). Bottom-mounted acoustic recorders were deployed in Bristol Bay and the northern Gulf of Alaska in 2000 to document the seasonal distribution of right whale calls. Preliminary analysis of the data from the recorders indicates that right whales remain in the southeastern Bering Sea at least through ~~October~~November (~~L. Munger, pers. com.~~Munger et al. 2003). Right whales have not been observed outside the localized area in the southeastern Bering Sea during surveys conducted for fishery management purposes which covered a broader area of Bristol Bay and the Bering Sea (Moore et al. 2000, 2002; see Fig. 35 for locations of tracklines for these surveys).

The following information was considered in classifying stock structure according to the Dizon et al. (1992) phylogeographic approach: 1) Distributional data: distinct geographic distribution; 2) Population response data: unknown; 3) Phenotypic data: unknown; and 4) Genotypic data: unknown. Based on this limited information, two stocks of North Pacific right whales are currently recognized: a Sea of Othotsk stock and an eastern North Pacific Stock (Rosenbaum et al.; 2000).

POPULATION SIZE

The pre-exploitation size of this stock exceeded 11,000 animals (NMFS 1991). Based on sighting data, Wada (1973) estimated a total population of 100-200 in the North Pacific. Rice (1974) stated that only a few individuals remained in the eastern North Pacific stock, and that for all practical purposes the stock was extinct because no sightings of a cow with calf have been confirmed since 1900 (D. Rice, pers. comm., National Marine Fisheries Service). A reliable estimate of abundance for the North Pacific right whale stock is currently not available.

~~There have been several recent sightings of right whales in the North Pacific.~~**There were several sightings of North Pacific right whales in the mid-1990s which renewed interest in conducting dedicated surveys for right whales.** On April 2, 1996 a right whale was sighted off of Maui (~~D. Salden, pers. comm., Hawaii Whale Research Foundation~~**Salden and Mickelsen 1999**). This was the first documented sighting of a right whale in Hawaiian waters since 1979 (Herman et al. 1980, Rowntree et al. 1980). ~~More importantly, a~~**A** group of 3-4 right whales was sighted in western Bristol Bay, southeastern Bering Sea (July 30, 1996) which may have included a juvenile animal (Goddard and Rugh 1998). During July 1997, a group of 4-5 individuals was encountered one evening in Bristol Bay, followed by a second sighting of 4-5 whales the following morning in approximately the same location (Tynan 1999).

During **dedicated surveys in** July 1998, July 1999, and July 2000, ~~six, five, and eight~~**five, six, and thirteen** right whales, respectively, were again found in the same general region of the southeastern Bering Sea (Leduc et al. ~~2000~~**2001**) ~~and W. Perryman. pers. comm., National Marine Fisheries Service~~). **Biopsy samples of right whales encountered in the southeastern Bering Sea were taken in 1997 and 1999. Genetics analyses identified 3 individuals in 1997 and 4 individuals in 1999; of the animals identified, one was identified in both years, resulting in a total genetic count of 6 individuals (LeDuc et al. 2001).** Genetic analyses on samples from all ~~5~~**6** whales ~~seen~~**sampled** in 1999 determined that the animals were ~~all~~ male (LeDuc et al.; 200~~0~~**1**). **Two right whales were recorded during a vessel-based survey in the central Bering Sea in July of 1999 (Moore et al.; 2000).**

Aerial photogrammetric analyses indicated that one of the animals **was** seen in **1997, 1998 and** 1999 ~~was also seen in 1998~~ (LeDuc et al.; 200~~0~~**1**). **Body lengths of 12 animals ranged from 14.7 to 17.6m (LeDuc et al. 2001); since body length at sexual maturity has been estimated at about 15m, LeDuc et al (2001) hypothesize that all measured animals may have been sexually mature.** ~~Two right whales were recorded during a vessel-based survey in the central Bering Sea in July of 1999 (Moore et al., 2000). Of the eight whales seen during the July 2000 aerial survey, 6 were new animals which had not been seen previously, one was a re-sight, and one could not be reliably identified (R. LeDuc, pers. comm., National Marine Fisheries Service).~~

Preliminary information from the Bristol Bay survey in 2002 indicates that there were seven sightings of right whales; it is not yet known how many of these animals were seen in previous years (NMFS, unpublished data). One of the sightings **in 2002** included a right whale calf; this is the first confirmed sighting of a calf in decades (a possible calf or juvenile sighting was reported in Goddard and Rugh 1998). It is notable that~~, with the exception of one right whale observed south of Kodiak Island in 1998 (Waite et al. 2002),~~ all recent right whale sightings in **the Bering Sea** ~~Alaskan waters~~ have occurred in the small area depicted on the distribution map (Fig. 37) ~~this box~~, despite substantially increased aerial and vessel survey effort in other parts of the Bering Sea ~~and Gulf of Alaska~~ in recent years.

There are fewer recent sightings of right whales in the Gulf of Alaska than in the Bering Sea. Waite et al. 2003 summarized sightings from the Platforms of Opportunity Program from 1959-97. Seven sightings of right whales were reported, but only one sighting of 4 right whales at the mouth of Yakutat Bay in 1979 could be positively identified (Waite et al. 2003). One recent sighting of a right whale off Kodiak Is occurred in 1998 during an aerial survey for small cetaceans in the Gulf of Alaska. This sighting prompted researchers to plan an acoustic monitoring study off Kodiak Island during 2000; results from recordings made between 26 May and 11 September include one series of calls in early September that may have been from a right whale (Waite et al. 2003).

Minimum Population Estimate

At this time, it is not possible to produce a reliable estimate of minimum abundance for this stock, as a current estimate of abundance is not available. However, it is worth noting that, although only ~~14~~**13** individual animals have been photographed during aerial surveys ~~during~~**in** 1998, 1999, and 2000, there have already been two occurrences of animals which have been photographed in more than one year **(LeDuc et al. 2001)**. This "mark-recapture" success rate is consistent with a very small population size.

Current Population Trend

A reliable estimate of trend in abundance is currently not available.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Due to insufficient information, it is recommended that the default cetacean maximum net productivity rate (R_{MAX}) of 4% be employed for this stock (Wade and Angliss 1997). However, this default rate is likely an underestimate based on the work reported by Best (1993).

POTENTIAL BIOLOGICAL REMOVAL

Under the 1994 reauthorized Marine Mammal Protection Act (MMPA), the potential biological removal (PBR) is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: $PBR = N_{MIN} \times 0.5R_{MAX} \times F_R$. The recovery factor ($F_R$) for this stock is 0.1, the recommended value for cetacean stocks which are listed as endangered (Wade and Angliss 1997). However, because a reliable estimate of minimum abundance is currently not available, the PBR for this stock is unknown.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

Gillnets were implicated in the death of a right whale off the Kamchatka Peninsula (Russia) in October of 1989 (Kornev 1994). No other incidental takes of right whales are known to have occurred in the North Pacific. Any mortality incidental to commercial fisheries would be considered significant.

Based on the lack of reported mortalities, the estimated annual mortality rate incidental to commercial fisheries is zero whales per year from this stock. Therefore, the annual human-caused mortality level is considered to be insignificant and approaching a zero mortality and serious injury rate.

Subsistence/Native Harvest Information

Subsistence hunters in Alaska and Russia are not reported to take animals from this stock.

Other Mortality

Right whales are large, slow-swimming, tend to congregate in coastal areas, and have a thick layer of blubber which enables them to float when killed. These attributes made them an easy and profitable species for early (pre-modern) whalers. By the time the modern (harpoon cannons and steam powered catcher boats) whale fishery began in the late 1800s, right whales were rarely encountered (Braham and Rice 1984). Between 1835 and 1909, an estimated 15,374 right whales were taken from the North Pacific by American-registered whaling vessels, with most of those animals taken prior to 1875 (Best 1987, IWC 1986). In addition, 28 right whales were killed between 1914 and 1951 in Alaskan and British Columbian waters (Reeves et al. 1985). The estimated mortality likely underestimates the actual kill as a result of under-reporting of the Soviet catches (Yablokov 1994).

Ship strikes and entanglement in fishing gear are significant sources of mortality for the North Atlantic stock of right whales, and it is possible that right whales in the North Pacific are also vulnerable to these sources of mortality. However, due to their rare occurrence and scattered distribution it is impossible to assess the threat of ship strikes or entanglement to the North Pacific stock of right whales at this time.

STATUS OF STOCK

The right whale is listed as "endangered" under the Endangered Species Act of 1973, and therefore designated as "depleted" under the MMPA. NMFS now considers the North Pacific animals to be distinct at the species level from North Atlantic animals. As a result, the stock is classified as a strategic stock. Reliable estimates of the minimum population size, population trends, and PBR are currently not available. Though reliable numbers are not known, the abundance of this stock is considered to represent only a small fraction of its precommercial whaling abundance (i.e., the stock is well below its Optimum Sustainable Population size). The estimated annual rate of human-caused mortality and serious injury seems minimal for this stock. The reason(s) for the apparent lack of recovery for this stock is(are) unknown.

On 4 October 2000, NMFS received a petition from the Center for Biological Diversity to designate critical habitat for this stock. Petitioners asserted that the southeast Bering Sea shelf from 55-60° N latitude should be considered critical habitat. On 1 June 2001, NMFS found the petition to have merit (66 FR 29773). On 20 February 2002, NMFS announced a decision to not designate critical habitat for North Pacific right whales (67 FR 7660) at this time. NMFS

concluded that the information available did not indicate that the physical or biological features essential to the conservation of the species exist throughout the petitioned area, and that a smaller area may contain essential physical and biological features, but the boundary of this smaller area could not yet be defined. Thus, NMFS determined that critical habitat was undeterminable at this time. However, NMFS will be evaluating new information collected during field studies conducted in 2002, and may propose to designate critical habitat at that time if the new information indicates that certain areas are critical for the conservation of the species and require special management considerations.

CITATIONS

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